

PATENT COOPERATION TREATY  
**PCT**

**INTERNATIONAL SEARCH REPORT**

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>PHN 17.662W0</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/EP 00/ 09483</b>	International filing date (day/month/year) <b>26/09/2000</b>	(Earliest) Priority Date (day/month/year) <b>01/10/1999</b>
Applicant <b>KONINKLIJKE PHILIPS ELECTRONICS N.V. et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1  
☐ None of the figures.

# INTERNATIONAL SEARCH REPORT

International Application No

P 00/09483

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H01J5/46 H01K1/40

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H01J H01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 923 470 A (DAMSTEEG CORNELIS JAN ET AL) 2 December 1975 (1975-12-02) claims 1,2	1,2
Y	EP 0 573 114 A (PHILIPS ELECTRONICS NV) 8 December 1993 (1993-12-08) cited in the application claim 1	1,2
A	US 4 039 883 A (DAMSTEEG CORNELIS JAN ET AL) 2 August 1977 (1977-08-02) claims 1,3  -/--	1,2

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*G\* document member of the same patent family

Date of the actual completion of the international search

19 January 2001

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29/01/2001

Name and mailing address of the ISA  
European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Deroubaix, P

# INTERNATIONAL SEARCH REPORT

International Application No

PO 00/09483

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 013, no. 272 (E-777), 22 June 1989 (1989-06-22) & JP 01 063255 A (TDK CORP), 9 March 1989 (1989-03-09) abstract ----	1
A	US 5 624 769 A (LI YANG ET AL) 29 April 1997 (1997-04-29) claims 1,3 ----	1,2
A	US 5 254 359 A (ZURECKI ZBIGNIEW ET AL) 19 October 1993 (1993-10-19) claim 1 ----	1
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 04, 30 April 1999 (1999-04-30) & JP 11 012566 A (HITACHI METALS LTD), 19 January 1999 (1999-01-19) abstract -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 00/09483

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3923470 A	02-12-1975	NL 7209332 A AU 5744873 A BE 801807 A CA 978426 A DE 2330169 A FR 2190569 A GB 1435541 A JP 49052750 A JP 53047776 B US 4039883 A	08-01-1974 09-01-1975 02-01-1974 25-11-1975 24-01-1974 01-02-1974 12-05-1976 22-05-1974 23-12-1978 02-08-1977
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JP 11012566 A	19-01-1999	NONE	

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Eindhoven (NL). TUNISSEN, Mathias, L., M. [NL/NL];  
Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number: PCT/EP00/09483

(74) Agent: ROLFES, Johannes, G., A.; Internationaal Octrooibureau B.V., Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

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— With international search report.

(71) Applicant (*for all designated States except US*): KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

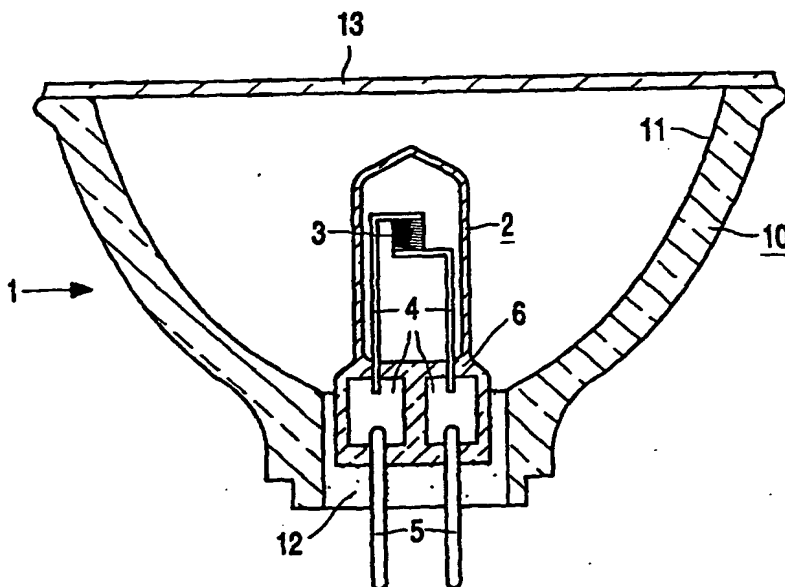
— Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): STEINMAN, Maarten, W. [NL/NL]; Prof. Holstlaan 6, NL-5656 AA

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: ELECTRIC LAMP



(57) Abstract: The electric lamp (1) has a lamp vessel (2), wherein an electric element (3) is accommodated. Said element is connected to current conductors (4), molybdenum end portions (5) of which extend outside the lamp vessel and have a skin of titanium nitride or chromium carbide as a protection against oxidation.

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Electric lamp.

The invention relates to an electric lamp comprising  
a glass lamp vessel which is closed in a gastight manner and in which an  
electric element is accommodated,

current conductors connected to the electric element which each have an end  
5 portion of molybdenum projecting to outside the lamp vessel, said end portion being provided  
with means for protection against oxidation.

Such an electric lamp is known from EP 573 114.

10 Current conductors with molybdenum end portions are often used in electric  
lamps because this metal is resistant to high temperatures and because this metal has a  
coefficient of expansion which matches that of hard glasses well and deviates only little from  
that of quartz glass, i.e. glass with an  $\text{SiO}_2$  content of at least 95% by weight.

It is a disadvantage of molybdenum, however, that it readily oxidates at room  
15 temperature already, so that there is a considerable risk that a good electrical contact with, for  
example, the connection terminals of a lampholder will be lost.

According to the cited patent document, the end portions are provided with a  
molybdenum nitride coating. A disadvantage of the known lamp is, however, that an oxidation  
resistance up to no more than a comparatively low temperature, i.e. approximately 200 °C, is  
20 obtained. Furthermore, the coating has the additional disadvantage that the end portions  
become more liable to fracture.

It is an object of the invention to provide an electric lamp of the kind described  
25 in the opening paragraph in which the above disadvantages are counteracted.

According to the invention, this object is achieved in that the electric lamp of  
the kind described in the opening paragraph is characterized in that the end portion has a skin  
which is chosen from a group of materials formed by titanium nitride and chromium carbide.

The titanium nitride or chromium carbide skin is not only easy to realize, but it is also an effective agent against oxidation not only at room temperature but also at elevated temperatures, for example up to approximately 400 °C. Titanium nitride and chromium carbide, moreover, have the advantages that they do not lead to an increased brittleness of the molybdenum end portion and that they are thermally stable also at very high temperatures, for example 2000 °C. That is to say that titanium nitride and chromium carbide substantially do not form compounds or alloys with molybdenum which melt at lower temperatures than those used in the manufacture of the lamp. The thermal stability at very high temperatures also implies that no dissociation of the compounds occurs owing to the high temperature, leading to compounds which are unsuitable for the oxidation-resistant coating. This renders said compounds suitable for use as a skin on metal parts which is effective against oxidation, for example in lamps, for example quartz glass lamps, for which very high temperatures are used in the lamp manufacturing process.

Preferably, the skin has a layer thickness of at least 2 µm and at most 3 µm. A layer thickness below 2 µm provides the molybdenum with an insufficient protection against oxidation. A layer thickness above 3 µm is unnecessarily expensive because it does not provide any better protection against oxidation than a skin with a layer thickness of 3 µm.

The oxidation-resistant skin on the molybdenum end portion may be readily obtained in a vapor deposition process, for example a CVD process. The CVD process has the advantage that many molybdenum end portions can be vaporized simultaneously in one and the same process. A molybdenum end portion provided with an oxidation-resistant skin can thus be manufactured comparatively inexpensively.

In spite of the protection against oxidation provided by the titanium nitride or chromium carbide skin, the protected end portion can be processed in a conventional manner, for example by welding to a metal foil, for example to a molybdenum foil on which a gastight seal of the lamp vessel is realized. A good electrical connection, which is only a few mΩ larger than in the case of platinum or platinum-plated end portions, can be realized on the protected end portion, for example by means of contacts of a lampholder.

The electric element of the lamp may be a pair of electrodes in an ionizable gas or an incandescent body, for example in an inert gas comprising halogen. The lamp vessel may have one or several seals from which a current conductor issues to the exterior. The lamp vessel, for example made of quartz glass or hard glass, may be joined together with a reflector body so as to form a lamp.

An embodiment of the electric lamp according to the invention is shown in longitudinal sectional view in the drawing.

5 In the figure, the electric lamp 1 has a glass lamp vessel 2 which is closed in a gastight manner and in which an electric element 3, an incandescent body in the Figure, is accommodated, and a reflector body 10 which has a mirroring surface 11 and a closing plate 13. The lamp vessel 2 is secured in the reflector body 10 by means of cement 12. Current  
10 conductors 4 having molybdenum end portions 5 projecting to outside the lamp vessel 2 are connected to the electric element 3. The end portion 5 has means for protection against oxidation. The end portion 5 for this purpose has a skin of chromium carbide. The skin has a layer thickness of approximately 2.5  $\mu\text{m}$ .

In the Figure, the current conductors 4 comprise legs of the incandescent body 3 and molybdenum foils connected thereto by means of welds. End portions 5 provided with  
15 chromium carbide skins are also welded to the foils and serve as contact pins for the lamp.

Experiments with this lamp 1, which has a rated power of 100 W and a lamp voltage of 12 V, have demonstrated that the lamp 1 has a useful life which is twice that of a known lamp, and a useful life equal to that of a lamp having end portions 5 provided with a platinum coating.

20 The lamp shown may be used, for example, for accent lighting, for projection purposes, or for photo, video, or film recording sessions.



## CLAIMS:

1. An electric lamp comprising  
a glass lamp vessel (2) which is closed in a gastight manner and in which an  
electric element (3) is accommodated,  
current conductors (4) connected to the electric element which each have an end  
5 portion (5) of molybdenum projecting to outside the lamp vessel, said end portion being  
provided with means for protection against oxidation,  
characterized in that the end portion (5) has a skin which is chosen from a group  
of materials formed by titanium nitride and chromium carbide.
- 10 2. An electric lamp as claimed in claim 1, characterized in that the skin has a layer  
thickness of at least 2  $\mu\text{m}$  and at most 3  $\mu\text{m}$ .

1/1

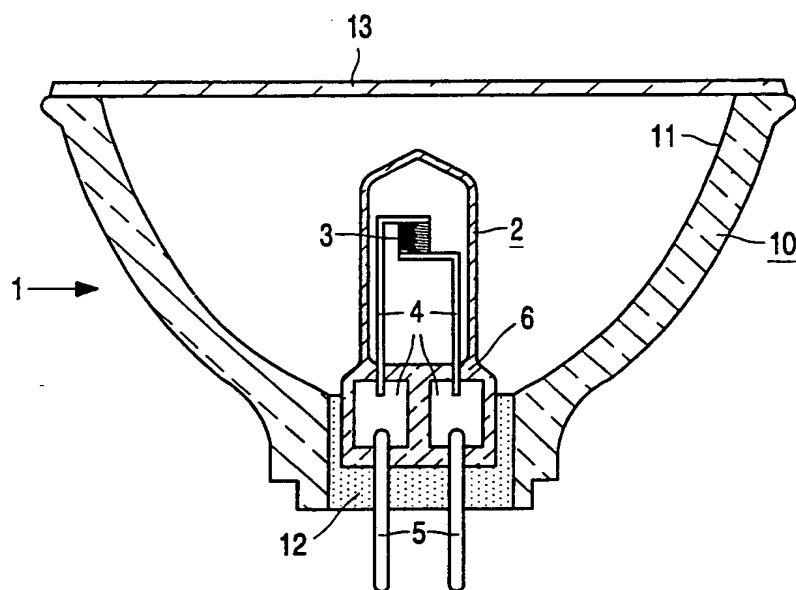


FIG. 1

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International Application No

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WPI Data, PAJ, EP0-Internal

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Date of the actual completion of the international search

19 January 2001

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Deroubaix, P

# INTERNATIONAL SEARCH REPORT

Intern. Application No.

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